

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- HARDWARE
NUMBER: M0-AG1-E02 -X

SUBSYSTEM NAME: REMOTELY OPERATED FLUID UMBILICAL (ROFU)
REVISION: 12/08/02

PART DATA

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
:ROFU	V847-544100-001
:FLEX HOSE	ME271-0105-1000/-2000/-3000
TITFLEX	115560-1000/-2000/-3000

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
ME271-0105-2000 IS UPPER FLEX HOSE ON ROFU ARM
ME271-0105-3000 IS LOWER FLEX HOSE ON ROFU ARM
ME271-0105-1000 (2) PAYLOAD FLEX HOSE (PDA)

REFERENCE DESIGNATORS: 40P848FH1
40P848FH2
40P847FH1
40P847FH2

QUANTITY OF LIKE ITEMS:
ONE EACH PER DASH NO.

FUNCTION:
FLEX HOSES HAVE AN INNER CORE OF TEFLON CONVOLUTED TUBING WITH STAINLESS STEEL WIRE BRAID OUTER REINFORCEMENT. HOSE LENGTHS ARE APPROXIMATELY 46 IN. AND 50 IN., AND LINE SIZE IS 5/8 IN. DIAMETER. OPERATING PRESSURE IS 300 PSIA. LENGTH OF ODA FLEXIBLE SECTION IS 33.8 ± 0.25 IN., PDA FLEXIBLE SECTION IS 23 ± 0.25 IN.
FLEX HOSES ARE PART OF PAYLOAD COOLANT SUPPLY AND RETURN LINE, AND ACCOMMODATE MOVEMENT OF THE ROFU SWING ARM DURING DEPLOY/STOW CYCLE FOR QD MATE/DEMATE.

FAILURE MODES EFFECTS ANALYSIS FMEA -- FAILURE MODE

NUMBER: M0-AG1-E02- 01

REVISION#: 01/23/03

SUBSYSTEM NAME: REMOTELY OPERATED FLUID UMBILICAL (ROFU)

LRU: FLEX HOSE

ITEM NAME: FLEX HOSE

**CRITICALITY OF THIS
FAILURE MODE:** 2/2

FAILURE MODE:

EXTERNAL LEAKAGE

MISSION PHASE:

- PL PRE-LAUNCH
- LO LIFT-OFF
- OO ON-ORBIT
- DO DE-ORBIT
- LS LANDING/SAFING

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

- 102 COLUMBIA
- 103 DISCOVERY
- 104 ATLANTIS
- 105 ENDEAVOUR

CAUSE:

VIBRATION, CYCLING OF ARM, OVER OR UNDERTORQUED COUPLING, ABRASION, CRACKED WELD OR TUBING, INADEQUATE SUPPORT, DEFECTIVE SEAL, FATIGUE, OVERPRESSURE, OVERHEATING, MANUFACTURING DEFECT, JAMMED ROLLER SUPPORT, GROUND HANDLING.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

- A) N/A
- B) N/A
- C) N/A

PASS/FAIL RATIONALE:

- A)
N/A
- B)
N/A
- C)
N/A

- FAILURE EFFECTS -

(A) SUBSYSTEM:

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- FAILURE MODE
NUMBER: M0-AG1-E02- 01**

THE ACTIVE COOLING SYSTEM CONTAINS LESS THAN 3 GALLONS OF WATER WHEN IT IS NOT CONNECTED WITH MPLM OR 9 GALLONS IF CONNECTED. DEPENDING ON SIZE, ANALYSIS INDICATES THAT, AT THE MOST, APPROXIMATELY 50 IN³ (~ 4 CUPS) OF WATER WOULD BE RELEASED. POSSIBLE LOSS OF ACTIVE COOLING FOR PAYLOAD IN ORBITER PAYLOAD BAY.

(B) INTERFACING SUBSYSTEM(S):

FAILURE IS INDEPENDENT OF ORBITER ECLSS SYSTEM. NO EFFECT ON EQUIPMENT IN PAYLOAD BAY. LEAKED FLUID WOULD FREEZE OR SUBLIMATE ON ORBIT.

(C) MISSION:

POSSIBLE LOSS OF MISSION OBJECTIVE (ISS SUPPORT).

(D) CREW, VEHICLE, AND ELEMENT(S):

NO EFFECT ON CREW OR ORBITER. ANALYSIS INDICATES THAT THE SMALL QUANTITY OF WATER [50 OR SO CUBIC INCHES (~ 4 CUPS)] THAT WOULD BE RELEASED DOES NOT POSE A HAZARD TO THE ORBITER. (REF. ANALYSIS NO. GDS-FSSO-02-012, DATED DECEMBER 12, 02)

SUCCESS PATHS REMAINING AFTER FIRST FAILURE: 0

- TIME TO EFFECT -

REACTION TIME: IMMEDIATE

-DISPOSITION RATIONALE-

(A) DESIGN:

REINFORCEMENT MATERIAL IS STAINLESS STEEL WIRE BRAID. INNER CORE IS THREE PLY TEFLON CONVOLUTED TUBE. END FITTINGS WITHSTAND 2.5 TIMES MAX. ALLOWABLE TORQUE. PROOF PRESSURE IS TWICE MAX. OPERATING PRESSURE. BURST PRESSURE IS 4.0 TIMES MOP. THE TWO HOSES ARE SUPPORTED BY FIXED AND MOVABLE CLAMPS.

(B) TEST:

A DELTA QUALIFICATION TEST SERIES WILL BE PERFORMED FOR VIBRATION, SHOCK AND FLEXURE. BURST PRESSURE OF 1200 PSI (4.0 TIMES MOP) WILL BE DEMONSTRATED. ACCEPTANCE TESTS ON EACH DELIVERABLE FLEX HOSE ASSY INCLUDE EXAMINATION OF PRODUCT AND FOUR PROOF PRESSURE LEAKAGE TESTS USING NITROGEN AT 300 PSI FOR 5 MINUTES. LEAKAGE MUST NOT EXCEED 1 X 10 TO MINUS 4 SCCS.
GROUND TURNAROUND TEST
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

RECEIVING INSPECTION

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- FAILURE MODE
NUMBER: M0-AG1-E02- 01**

MATERIAL AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION. ALL PURCHASED PARTS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL
INSPECTION VERIFIES CLEANLINESS IS MAINTAINED. VISUAL INSPECTION IS PERFORMED PRIOR TO DELIVERY.

ASSEMBLY/INSTALLATION
DIMENSIONS OF DETAIL PARTS, IDENTIFICATION, INSTALLATION ON SWING ARM AND PAYLOAD DISCONNECT ASSEMBLIES (PDA) ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
HEAT TREATMENTS ARE VERIFIED BY INSPECTION.

TESTING
ACCEPTANCE TESTS OF THE FLEX HOSES PER APPLICABLE PROCEDURES ARE VERIFIED BY INSPECTION PRIOR TO DELIVERY. INSPECTION ALSO VERIFIES ACCEPTANCE TESTS OF SWING ARM AND PAYLOAD DISCONNECT ASSEMBLIES WITH FLEX HOSES INSTALLED.

HANDLING / PACKAGING
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATA BASE

(E) OPERATIONAL USE:

NONE.

- APPROVALS -

S&R ENGINEER	:D. MAYNE	:/S/ D. M. MAYNE_____
CARGO/INTEG ITM.	:J. CAPALENI	:/S/ BOB DUEEASE FOR_____
DESIGN ENGINEER	:L. T. HARPER	:/S/ L. T. HARPER_____
SSM	:L. J. SALVADOR	:/S/ PHAM HOE FOR_____
NASA/DCE	:B. BROWN	:/S/ B. BROWN_____
MOD	:C. STEPHENSON	:/S/ C. STEPHENSON_____
SR&QA	:H. MALTBY	:/S/ HARRY MALTBY_____
USA/SAM	:R. SMITH	:/S/ R. SMITH_____
USA CARGO/INTG ELEMENT	:S. KUNKEL	:/S/ S. KUNKEL_____
USA ORBITER ELEMENT	S. LITTLE	:/S/ SUZANNE LITTLE_____